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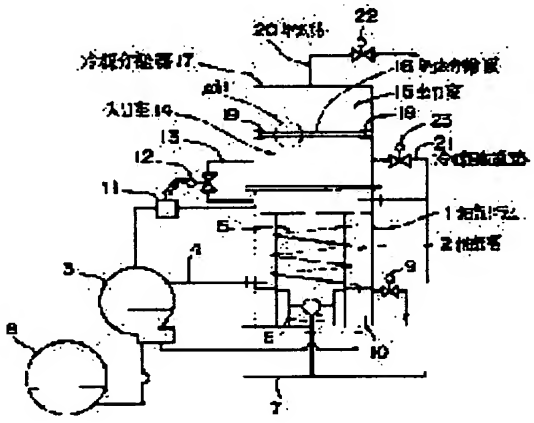
(54) BLEEDING DEVICE FOR FREEZER

(57)Abstract:
PURPOSE: To reduce an amount of refrigerant gas discharged from a bleed drum to the outside togetherwith air.
CONSTITUTION: A bleed drum 1 having a bleed chamber 2 for non-condensed gas and a refrigerant separator 17 having a gas separating film 16 to separated air and a refrigerant from each other located between an inlet chamber 14 communicated to the bleed chamber 2 and an outlet chamber 15 communicated to a discharge passage 20 through which the open air is released are provided. A refrigerant recovery passage 21 is communicated to the inlet chamber 14, bleed gas bled by the bleed chamber 2 flows to the refrigerant separator 17. Air and a refrigerant, which are different in the size of a molecule, are separated from each other by means of the gas separating film 16, a refrigerant not permeating the gas separating film 16 is recovered through the refrigerant recovery passage 21 and an amount of refrigerant gas discharged to the outside togetherwith air is reduced.



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CLAIMS

[Claim(s)]
[Claim 1] It has the bleeding drum 1 with the bleeding room 2 of noncondensing gas, and the inlet-port room 14 and the outlet room 15. Between said inlet-port rooms 14 and outlet rooms 15 While having the refrigerant eliminator 17 which infixed the gas permeation membrane 16 which separates air and a refrigerant and making said bleeding room 2 open said inlet-port room 14 for free passage Bleeding equipment for refrigerators characterized by making said outlet room 15 open the exhaust passage 20 of atmospheric-air disconnection for free passage, and making said inlet-port room 14 open the refrigerant recovery path 21 for free passage.
[Claim 2] It has the bleeding drum 1 with the bleeding room 2 of noncondensing gas, and the inlet-port room 14 and the outlet room 15. Between said inlet-port rooms 14 and outlet rooms 15 Bleeding equipment for refrigerators characterized by having opened the outside of said hollow fiber 30 wide to atmospheric air while having refrigerant eliminator 17a which infixed the hollow fiber 30 which separates air and a refrigerant, making said bleeding room 2 open said inlet-port room 14 for free passage and making the outlet room 15 open the refrigerant recovery path 21 for free passage.
[Claim 3] The bleeding piping 40 which is open for free passage in the gas region of the condenser 3 in a refrigerator, and the bleeding pump 41 which is connected to this bleeding piping 40, and attracts and carries out the regurgitation of the bled gas in the gas region of said condenser 3, Bleeding drum 1a which was connected to the outlet of the condenser 43 for bleeding which makes said bled gas condense, and this condenser 43, and had bleeding room 2a which separates noncondensing gas and the condensed refrigerant, Bleeding equipment for refrigerators characterized by having prepared refrigerant eliminator 17b which infixed the gas permeation membrane 16 which has the inlet-port room 14 and the outlet room 15 which are open for free passage to said bleeding room 2a, and separates air and a refrigerant between said inlet-port rooms 14 and outlet rooms 15.
[Claim 4] In the bleeding equipment which is equipped with the bleeding drum 1 with the gas region of the condenser 3 in a refrigerator, and the bleeding room 2 open for free passage, and was bled by the differential pressure of the condensation pressure in said refrigerator, and the internal pressure of said drum 1 While forming the refrigerant eliminator 17 which infixed the gas permeation membrane 16 which has the inlet-port room 14 and the outlet room 15 which are open for free passage in said bleeding room 2, and separates air and a refrigerant between said inlet-port rooms 14 and outlet rooms 15 Bleeding equipment for refrigerators characterized by infixing booster-pump 41a which forms the free passage way 13 between said inlet-port rooms 14 and said bleeding rooms 2, pressurizes the noncondensing gas of the bleeding room 2 on this free passage way 13, and is supplied to said inlet-port room 14.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the bleeding equipment for refrigerators, and the bleeding equipment for refrigerators which extracts the noncondensing gas which includes in detail the air which collects in condensers, such as a turbo refrigerating machine, and is discharged outside.
[0002]
[Description of the Prior Art] As this bleeding equipment for seed refrigerators was indicated by JP,2-254271,A and was conventionally shown in drawing 8 The interior of the condensator D made into the coiled form is carried out to the bleeding drum C connected to the gas region of Condenser A through a communication trunk B. Circulate liquid cooling intermediation from **** of Evaporator G to this condensator D, and the mixed gas of the refrigerant gas and air which are wide opened by said bleeding drum C from said communication trunk B is cooled. While dissociating from the noncondensing gas which is made to condense a refrigerant gas by this cooling, and includes air, he opens the bleeding valve E from the exhaust passage F which connected to the upper part of said bleeding drum C noncondensing gas including the air which remains in said bleeding drum C without condensing, and is trying to discharge outside.
[0003]
[Problem(s) to be Solved by the Invention] Some refrigerant gases had the problem discharged outside with air by open actuation of said bleeding valve E, without separating it completely, since the place dissociated with the noncondensing gas which is made to condense a refrigerant gas by cooling of said condensator D on said bleeding drum C, and includes air with the above bleeding equipments for refrigerators.
[0004] The noncondensing gas which separates this invention with a refrigerant in said bleeding drum C is mainly air, and even if the molecular size of the oxygen which constitutes this air, and nitrogen compares as an example the chlorofluocarbon R123 used for a refrigerator as a refrigerant, it is smaller than that molecular size. Namely, oxygen molecular size notes, for example that it uses as a refrigerant to being 3.1-3.3A that the molecular size of chlorofluocarbon R123 is 9.4A in the magnitude of 2.9A and a nitrogen content child. It is the thing which enabled it to separate a refrigerant gas from the noncondensing gas discharged from said bleeding drum C using the difference of these molecular size effectively, and the purpose is in the point of decreasing the refrigerant capacity discharged outside with air from a bleeding drum.
[0005]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, in this invention, it has the bleeding drum 1 with the bleeding room 2 of noncondensing gas, and the inlet-port room 14 and the outlet room 15. Between said inlet-port rooms 14 and outlet rooms 15 While having the refrigerant eliminator 17 which infixed the gas permeation membrane 16 which separates air and a refrigerant and making said bleeding room 2 open said inlet-port room 14 for free passage, said outlet room 15 was made to open the exhaust passage 20 of atmospheric-air disconnection for free passage, and said inlet-port room 14 was made to open the refrigerant recovery path 21 for free passage.
[0006] It has the bleeding drum 1 with the bleeding room 2 of noncondensing gas, and the inlet-port room 14 and the outlet room 15. Moreover, between said inlet-port rooms 14 and outlet rooms 15 While having refrigerant eliminator 17a which infixed the hollow fiber 30 which separates air and a refrigerant, making said bleeding room 2 open said inlet-port room 14 for free passage and making the outlet room 15 open the refrigerant recovery path 21 for free passage, the outside of said hollow fiber 30 may be wide opened to atmospheric air.
[0007] Moreover, the bleeding piping 40 which is open for free passage in the gas region of the condenser 3 in a refrigerator, The bleeding pump 41 which is connected to this bleeding piping 40, and attracts and carries out the regurgitation of the bled gas in the gas region of said condenser 3, Bleeding drum 1a which was connected to the outlet of the condenser 43 for bleeding which makes said bled gas condense, and this condenser 43, and had bleeding room 2a which separates noncondensing gas and the condensed refrigerant, It may have the inlet-port room 14 and the outlet room 15 which are open for free passage to said bleeding room 2a, and refrigerant eliminator 17b which infixed the gas permeation membrane 16 which separates air and a refrigerant between said inlet-port rooms 14 and outlet rooms 15 may be prepared.
[0008] Furthermore, have the bleeding drum 1 with the gas region of the condenser 3 in a refrigerator, and the bleeding room 2 open for free passage, and it sets to the bleeding equipment bled by the differential pressure of the condensation pressure in said refrigerator, and the internal pressure of said drum 1. While

forming the refrigerant eliminator 17 which infixed the gas permeation membrane 16 which has the inlet-port room 14 and the outlet room 15 which are open for free passage in said bleeding room 2, and separates air and a refrigerant between said inlet-port rooms 14 and outlet rooms 15 The free passage way 13 may be formed between said inlet-port rooms 14 and said bleeding rooms 2, and booster-pump 41a which pressurizes the noncondensing gas of the bleeding room 2 on this free passage way 13, and is supplied to said inlet-port room 14 may be infixed.

[0009]

[Function] The noncondensing gas bled at said bleeding room 2 It flows into said inlet-port room 14 with the refrigerant gas which remained without condensing, and molecular size compares with a refrigerant gas. The small noncondensing gas which consists mainly of air Said gas permeation membrane 16 is penetrated and it flows into said outlet room 15, and refrigerant gases can be effectively collected from said inlet-port room 14 through said refrigerant recovery path 21 to being discharged outside from said exhaust passage 20, without penetrating said gas permeation membrane 16.

[0010] Therefore, when discharging outside the noncondensing gas bled at said bleeding room 2 from said outlet room 15 of said refrigerant eliminator 17, the refrigerant capacity discharged outside with air can be decreased.

[0011] Moreover, while having cooling eliminator 17a which infixed the hollow fiber 30 between the inlet-port room 14 and the outlet room 15 and connecting the refrigerant recovery path 21 to the outlet room 14 Although the noncondensing gas bled at the bleeding room 2 flows into said inlet-port room 14 with a refrigerant gas when considering as the configuration which opens the outside of said hollow fiber 30 to atmospheric air While passing said hollow fiber 30, and the small noncondensing gas which consists mainly of air penetrates outside from the inside of said hollow fiber 30 and molecular size is discharged by atmospheric air as compared with a refrigerant gas Almost all the refrigerant gases that do not penetrate said hollow fiber 30 will flow into said outlet room 15, and are collected through said refrigerant recovery path 21.

[0012] Therefore, the noncondensing gas bled at said bleeding room 2 can be opened from said hollow fiber 30 of said refrigerant eliminator 17a to atmospheric air, and being able to decrease the refrigerant capacity discharged outside with air, since pressure resistance is large and said hollow fiber 30 can make sufficiently high the pressure which air is carried out [pressure] and makes said hollow fiber 30 penetrate, it can increase the separation effectiveness of air and a refrigerant gas so much.

[0013] Moreover, the bled gas in the gas region of said condenser 3 is attracted with said bleeding pump 41. After condensing with said condenser 43 for bleeding, it is made to flow into said bleeding room 2a. When separating the noncondensing gas which consists mainly of air, and the condensed refrigerant and dividing this noncondensing gas into air and a refrigerant gas by said refrigerant eliminator 17b further The pressure in said inlet-port room 14, i.e., the pressure of the noncondensing gas in the upstream of said gas permeation membrane 16, is made high. The separation efficiency of the air by said gas permeation membrane 16 and a refrigerant gas can be raised, and the refrigerant capacity discharged outside with air can be decreased further.

[0014] Furthermore, it sets to the bleeding equipment bled by the differential pressure of the condensation pressure in a refrigerator, and the internal pressure of the bleeding drum 1. When the noncondensing gas in the inlet-port room 14 of said refrigerant eliminator 17 which consists mainly of air is pressurized by booster-pump 41a Even if it can make high the pressure of the upstream of said gas permeation membrane 16 and is bleeding equipment of the auto purge form where the pressure of the bleeding gas in said bleeding room 2 is comparatively low The separation effectiveness of separating the air and the refrigerant gas by said gas permeation membrane 16 can be raised, and the refrigerant capacity discharged outside with air can be decreased certainly.

[0015]

[Example] What was shown in drawing 1 shows the bleeding equipment for refrigerators bled by cooling the bled gas from the condenser 3 in a refrigerator in the bleeding room 2 of the bleeding drum 1. In the bleeding room 2 of said bleeding drum 1 connected to the gas region of the condenser 3 in a refrigerator through a communication trunk 4 The interior of the condensator 5 which considered as the coiled form and connected the entrance side to **** of said condenser 3 is carried out. Circulate liquid cooling intermediation from **** of said condenser 3 to this condensator 5, and the bled gas which is the mixed gas of the refrigerant gas and air which are wide opened by said bleeding drum 1 from said communication trunk 4 is cooled. Make a refrigerant gas condense by this cooling, and refrigerant liquid and water are separated from noncondensing gas including air. While returning the condensed refrigerant liquid to the evaporator 8 of a refrigerator and collecting it from the float chamber 6 prepared in the center of the lower

part of said bleeding room 2 through the refrigerant return piping 7, he is trying to drain from the separator 10 which prepared water in the lower periphery section of said bleeding room 2 through the drain valve 9.
[0016] moreover, between the gas regions of said condenser 3, the upper part side of said bleeding room 2 While forming the bleeding differential pressure switch 11 which detects the differential pressure of the pressure of the gas region of this condenser 3, and the internal pressure of said bleeding room 2 The free passage way 13 which infixed in the upper part of said bleeding room 2 the solenoid valve 12 opened and closed by actuation of said differential pressure switch 11 is connected, and it enables it to flow out of said bleeding room 2 in the noncondensing gas which contained the refrigerant by open actuation of this solenoid valve 12, i.e., bleeding gas.
[0017] It has the inlet-port room 14 and the outlet room 15 in the upper part side of said bleeding drum 1. Furthermore, between said inlet-port rooms 14 and outlet rooms 15 Although oxygen and nitrogen which form the refrigerant eliminator 17 which infixed the gas permeation membrane 16 which separates air and a refrigerant, are a sheet-like about said gas permeation membrane 16 using the polyimide asymmetric membrane for example, by Ube Industries, Ltd., and constitute air are made to penetrate While forming in the shape of [which does not make a refrigerant gas with a large molecular size penetrate] film As shown in drawing 2 , reinforce with the reinforcement member 18, and said gas permeation membrane 16 is attached in the height direction pars intermedia of said refrigerant eliminator 17 through the supporter material 19 with this reinforcement member 18. Said inlet-port room 14 and the outlet room 15 are divided through said gas permeation membrane 16, and when oxygen and nitrogen which constitute air penetrate said gas permeation membrane 16 from said inlet-port room 14 to said outlet room 15, it enables it to separate air and the refrigerant gas which does not penetrate said gas permeation membrane 16.
[0018] Moreover, connect the point of said free passage way 13 linked to said bleeding room 2 to said inlet-port room 14, said bleeding room 2 is made to open said inlet-port room 14 for free passage through this free passage way 13, and it enables it to supply the bleeding gas which consists of the noncondensing gas whose content of a refrigerant gas was bled at said bleeding room 2 and decreased to said inlet-port room 14.
[0019] Moreover, while enabling it to discharge outside the air which consists of the oxygen which said outlet room 15 was made to open the exhaust passage 20 of atmospheric-air disconnection for free passage, and penetrated said gas permeation membrane 16, or nitrogen from said outlet room 15 Said inlet-port room 14 is made to open for free passage the refrigerant recovery path 21 which was open for free passage for said refrigerant return piping 7, and the refrigerant which does not penetrate said gas permeation membrane 16 is returned to said evaporator 8 through said refrigerant recovery path 21, and it enables it to collect them.
[0020] In addition, 22 and 23 are the closing motion valves infixed in said exhaust passage 20 and said refrigerant recovery path 21, respectively.
[0021] Although a deer is carried out, a refrigerant gas condenses at said bleeding room 2 by cooling of said condensator 5 and it dissociates with noncondensing gas, the refrigerant gas which remained without condensing flows into said inlet-port room 14 by open actuation of said solenoid valve 12 with noncondensing gas. And while the air to which molecular size changes from small oxygen and nitrogen as compared with a refrigerant gas penetrates said gas permeation membrane 16, flows into said outlet room 15 and is discharged outside from said exhaust passage 20, it dissociates with air, without penetrating said gas permeation membrane 16, and refrigerant gases are collected from said inlet-port room 14 by said evaporator 8 through said refrigerant recovery path 21.
[0022] Therefore, when discharging outside the noncondensing gas bled at said bleeding room 2 through said exhaust passage 20 from said outlet room 15 of said refrigerant eliminator 17, the refrigerant capacity discharged outside with air can be decreased.
[0023] Although the refrigerant eliminator 17 which infixed the gas permeation membrane 16 which separates air and a refrigerant between said inlet-port rooms 14 and outlet rooms 15 was used in the 1st example shown in drawing 1 , refrigerant eliminator 17a which infixed the hollow fiber 30 which separates air and a refrigerant like the 2nd example shown in drawing 3 R> 3 may be used.
[0024] Namely, while this refrigerant eliminator 17a isolates and prepares said inlet-port room 14 and said outlet room 15 Between said inlet-port rooms 14 and said outlet rooms 15, diameter extent of 1mm is cylindrical in the polyimide asymmetric membrane for example, by Ube Industries, Ltd. And many hollow fibers 30 formed in the shape of yarn are held in the shape of an airtight, are formed, and said inlet-port room 14 and the outlet room 15 are made to open for free passage mutually through these hollow fibers 30. Moreover, while making said outlet room 15 open for free passage said refrigerant recovery path 21 which was open for free passage for said refrigerant return piping 7, the outside of said hollow fiber 30 is opened

to atmospheric air.
[0025] In the 2nd example constituted as mentioned above, the noncondensing gas bled by cooling at said bleeding room 2 It flows into said inlet-port room 14 from said free passage way 13 with the refrigerant gas which remained without condensing. While passing said hollow fiber 30, and the small noncondensing gas which consists mainly of air penetrates outside from the inside of said hollow fiber 30 and molecular size is discharged by atmospheric air as compared with a refrigerant gas Almost all the refrigerant gases that do not penetrate said hollow fiber 30 outside from the inside will flow into said outlet room 15 of said refrigerant eliminator 17a, and are collected by said evaporator 8 through said refrigerant recovery path 21.

[0026] Therefore, the noncondensing gas bled at said bleeding room 2 can be opened from said hollow fiber 30 of said refrigerant eliminator 17a to atmospheric air, and the refrigerant capacity discharged outside with air can be decreased.
[0027] Moreover, since pressure resistance is large as compared with said gas permeation membrane 16 formed in the shape of a sheet and said hollow fiber 30 can make sufficiently high the pressure which air is carried out [pressure] and makes said hollow fiber 30 penetrate, it can increase the separation effectiveness of air and a refrigerant gas so much.
[0028] Although applying to the bleeding equipment of the auto purge type which forms said condensator 5 in said bleeding room 2, cools bled gas in this bleeding room 2, is made to condense a refrigerant gas by this cooling, and bled noncondensing gas in the example shown in drawing 1 and drawing 3 , it is applicable like the 3rd example shown in drawing 4 also to the reciprocating type bleeding equipment using a bleeding pump and the condenser for bleeding.
[0029] The 3rd example shown in drawing 4 forms the bleeding piping 40 which is open for free passage in the gas region of the condenser 3 in a refrigerator, and connects the bleeding pump 41 to this bleeding piping 40. By operation of this bleeding pump 41 While enabling it to attract the bled gas in the gas region of said condenser 3 through said bleeding piping 40 The condenser 43 for bleeding which attached the fan 42 to the discharge side of said bleeding pump 41, While condensing the bled gas which prepares bleeding drum 1a with bleeding room 2a which separates noncondensing gas and the condensed liquid cooling intermediation, and carries out the regurgitation from said bleeding pump 41 with said condenser 43 for bleeding It is what separates noncondensing gas and the condensed refrigerant liquid in bleeding room 2of said bleeding drum 1a a, and returned refrigerant liquid to the evaporator 8 of a refrigerator through the refrigerant return tubing 44 linked to the lower part of said bleeding drum 1a. The free passage way 47 which infixed in said bleeding room 2a the solenoid valve 45 and pressure gage 46 which serve as close at the time of shutdown on the way is connected, and the inlet-port room 15 of refrigerant eliminator 17b which carries out the postscript of said bleeding room 2a through this free passage way 47 is made open for free passage.
[0030] Said refrigerant eliminator 17b the inlet-port room 15 which is open for free passage to said bleeding room 2a through said free passage way 47 in the die-length direction end section of this casing 48 using the cylinder-like casing 48 Moreover, while forming the outlet room 15 which connected to the other end the refrigerant recovery path 21 which is open for free passage to the evaporator 8 in a refrigerator While said inlet-port room 14 and outlet room 15, inside said casing 48, a majority of the same hollow fibers 30 as the example shown in drawing 3 are arranged, and are constituted. As this hollow fiber 30 is expanded to drawing 5 and shown, gas permeation membrane 16 is formed with a diameter of about 1mm in the shape of a cylinder like the example of drawing 3 . While making said inlet-port room 14 and the outlet room 15 open for free passage mutually through the through tube 49 of these hollow fibers 30, in the both ends of said casing 48 Opening is carried out to the interior of this casing 48, and the exhaust pipe 50 which discharges the air which is noncondensing gas penetrated from said through tube 49 to the outside of said hollow fiber 30 in the open air from said casing 48 is formed, respectively.
[0031] In addition, 51 is the diaphragm prepared in said refrigerant recovery path 21, and he is trying for a pressure to act in said through tube 49 of said hollow fiber 30 with this drawing 21. Moreover, it may replace with this drawing 51 and a pressure regulating valve may be used. Moreover, in drawing 4 , said refrigerant recovery path 21 may be connected to **** of said condenser 3, although it connected with the evaporator 8.
[0032] In the case of the 3rd example of drawing 4 constituted as mentioned above By operation of said bleeding pump 41, the bled gas which is the mixed gas of a noncondensing gas and a refrigerant gas including the air in the gas region of said condenser 3 is attracted. After leading this bled gas to said condenser 43 for bleeding and condensing a refrigerant gas, the noncondensing gas which is made to flow into said bleeding room 2a, and consists mainly of air in this bleeding room 2a, and the condensed

refrigerant liquid are separated. And the separated refrigerant liquid is returned to the evaporator 8 of a refrigerator through the refrigerant return tubing 44 linked to the lower part of said bleeding drum 1a.
[0033] On the other hand, among the condensed refrigerant liquid, water, and the separated noncondensing gas, air It flows into the inlet-port room 14 of said refrigerant eliminator 17b through said free passage way 47 with the refrigerant gas which remained without condensing. Furthermore, penetrate outside said gas permeation membrane 16 which forms said hollow fiber 30 from said through tube 49, and it dissociates from a refrigerant gas. While being discharged by atmospheric air through said exhaust pipe 50 from said casing 48, the refrigerant gas which does not penetrate said gas permeation membrane 16 will flow into said outlet room 15, and are collected by said evaporator 8 through said refrigerant recovery path 21.
[0034] Therefore, the refrigerant capacity discharged outside with air from said exhaust pipe 50 can be decreased.
[0035] When chlorofluocarbon R123 was used as a refrigerant in a place using the example of drawing 4 and the discharge of the refrigerant gas discharged by the open air with air was investigated, the test result shown in drawing 6 was obtained. In drawing 6 , while the pressure in said inlet-port room 14 measured with said pressure gage 46, i.e., the supply pressure to said hollow fiber 30, is shown on an axis of abscissa, it is shown on the axis of ordinate, volume [of chlorofluocarbon R123] %, i.e., the concentration, contained in the discharge air content discharged from said exhaust pipe 50, and the air content discharged. In addition, Curve A shows change of a discharge air content, and Curve B shows change of chlorofluocarbon R123.
[0036] Volume % of the refrigerant R123 which volume % of the chlorofluocarbon R123 occupied to the discharge air content discharged from said exhaust pipe 50 of said refrigerant eliminator 17b changes like Curve B, for example, is occupied to this discharge air content by the 0.26l. [/o'clock] discharge air content when the pressure of said inlet-port room 14 is 2 kg/cm2G can decrease to 3% so that this test result may show.
[0037] Therefore, as shown in drawing 6 , volume % of the refrigerant R123 occupied to said discharge air content can be decreased, and the refrigerant capacity discharged outside with air as compared with the time of not using said refrigerant eliminator 17b can be decreased.
[0038] Although bleeding gas is pressurized and it was made to supply said refrigerant eliminator 17b in the 3rd example shown in drawing 4 as mentioned above using the bleeding pump 41 As shown in drawing 1 , when supplying bleeding gas to the inlet-port room 14 of said refrigerant eliminator 17 by differential pressure, as shown in drawing 7 , after infixing booster-pump 41a in the free passage way 13 and pressurizing the noncondensing gas of said bleeding room 2 by this booster-pump 41a, said inlet-port room 14 may be supplied.
[0039] Since it enables it to pressurize the bled bleeding gas which prepares said booster-pump 41a and flows out of said bleeding room 2 in the example shown in drawing 7 The pressure of said inlet-port room 14, i.e., the pressure of the upstream of said gas permeation membrane 16, can be made high. Since the pressure of said inlet-port room 14 can be carried out more than fixed (for example, more than 2 kg/cm2G) as shown in drawing 6 , even if it is bleeding equipment of the auto purge form where the pressure of the bleeding gas in said bleeding room 2 is comparatively low The refrigerant capacity discharged outside with air through said exhaust passage 20 from said outlet room 15 of said refrigerant eliminator 17 can be decreased.
[0040] In addition, even if the pressure of said bleeding gas which flows into said inlet-port room 14 in this case is more than 2 kg/cm2G, it cannot be overemphasized that said gas permeation membrane 16 is enough reinforced by said reinforcement member 18 so that long duration air can be separated.
[0041] Moreover, in the example shown in drawing 7 , refrigerant eliminator 17b shown in drawing 4 may be used.
[0042]
[Effect of the Invention] As explained above, it has the bleeding drum 1 with the bleeding room 2 of noncondensing gas, and the inlet-port room 14 and the outlet room 15. Between said inlet-port rooms 14 and outlet rooms 15 While having the refrigerant eliminator 17 which infixed the gas permeation membrane 16 which separates air and a refrigerant and making said bleeding room 2 open said inlet-port room 14 for free passage Since said outlet room 14 is made to open the exhaust passage 20 of atmospheric-air disconnection for free passage and said inlet-port room 14 is made to open the refrigerant recovery path 21 for free passage The inside of the noncondensing gas containing the refrigerant gas introduced into said inlet-port room 14 from said bleeding room 2, As for the small noncondensing gas which consists mainly of air, molecular size penetrates said gas permeation membrane 16 as compared with a refrigerant gas, and it flows into said outlet room 15. Refrigerant gases can be effectively collected from said inlet-port room 14

through said refrigerant recovery path 21 to being discharged outside from said exhaust passage 20, without penetrating said gas permeation membrane 16.

[0043] Therefore, when discharging outside the noncondensing gas bled at said bleeding room 2 from said outlet room 14 of said refrigerant eliminator 17, the refrigerant capacity discharged outside with air can be decreased.

[0044] Moreover, while having cooling eliminator 17a which infixed the hollow fiber 30 between the inlet-port room 14 and the outlet room 15 and connecting the refrigerant recovery path 21 to the outlet room 14 When it constitutes so that the outside of said hollow fiber 30 may be opened to atmospheric air Molecular size compares with a refrigerant gas among the noncondensing gas which flows into said inlet-port room 14 with the refrigerant gas which remained without condensing. The small noncondensing gas which consists mainly of air It penetrates outside from the inside of said hollow fiber 30, and is discharged by atmospheric air, and almost all the refrigerant gases that do not penetrate said hollow fiber 30 flow into said outlet room 15, and are collected through said refrigerant recovery path 21.

[0045] Therefore, being able to decrease the refrigerant capacity discharged outside with air, since pressure resistance is large and said hollow fiber 30 can make sufficiently high the pressure which air is carried out [pressure] and makes said hollow fiber 30 penetrate, it can increase the separation effectiveness of air and a refrigerant gas so much.

[0046] Moreover, the bled gas in the gas region of said condenser 3 is attracted with said bleeding pump 41. After condensing with said condenser 43 for bleeding, it is made to flow into said bleeding room 2a. When separating the noncondensing gas which consists mainly of air, and the condensed refrigerant and dividing this noncondensing gas into air and a refrigerant gas by said refrigerant eliminator 17b further The pressure in said inlet-port room 14, i.e., the pressure of the noncondensing gas in the upstream of said gas permeation membrane 16, is made high. The separation efficiency of the air by said gas permeation membrane 16 and a refrigerant gas can be raised, and the refrigerant capacity discharged outside with air can be decreased further.

[0047] Furthermore, it sets to the bleeding equipment bled by the differential pressure of the condensation pressure in a refrigerator, and the internal pressure of the bleeding drum 2. When it enables it to pressurize the noncondensing gas in the inlet-port room 14 of said refrigerant eliminator 17 which consists mainly of air by booster-pump 41a Even if it can make high the pressure of the upstream of said gas permeation membrane 16 and is bleeding equipment of the auto purge form where the pressure of the bleeding gas in said bleeding room 2 is comparatively low The separation effectiveness of separating the air and the refrigerant gas by said gas permeation membrane 16 can be raised, and the refrigerant capacity discharged outside with air can be decreased certainly.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the piping schematic diagram of the bleeding equipment for refrigerators which applied the 1st example of this invention.

[Drawing 2] It is the expansion explanatory view of the A section shown in drawing 1 .

[Drawing 3] It is the explanatory view of the refrigerant eliminator in which the 2nd example of this invention is shown.

[Drawing 4] It is the piping schematic diagram of the bleeding equipment for refrigerators which applied the 3rd example of this invention.

[Drawing 5] It is the expansion partial perspective view of the hollow fiber used for the 3rd example.
[Drawing 6] It is the graph which shows the test result using the bleeding equipment for refrigerators of the 3rd example.
[Drawing 7] It is the piping schematic diagram of the bleeding equipment for refrigerators which applied the 4th example of this invention.
[Drawing 8] It is the piping diagram showing the former.
[Description of Notations]
1 Bleeding Drum
2 Bleeding Room
14 Inlet-Port Room
15 Takumi Deguchi
16 Gas Permeation Membrane
17 Refrigerant Eliminator
20 Exhaust Passage
21 Refrigerant Recovery Path

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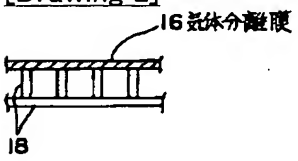
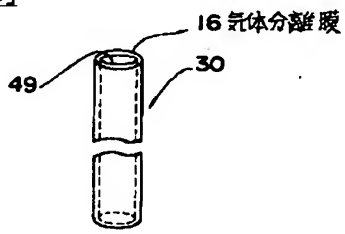
DRAWINGS

[Drawing 2]



[Drawing 5]



[Drawing 1]

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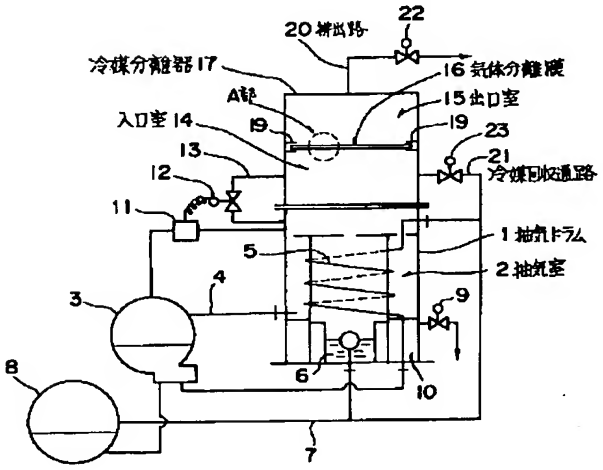
(54)【発明の名称】　冷凍機用抽気装置

(57)【要約】

【目的】　抽気ドラムから空気とともに外部に排出する冷媒ガス量を減少させる。

【構成】　不凝縮ガスの抽気室２をもつ抽気ドラム１と、抽気室２に連通する入口室１４及び大気開放の排出路２０に連通する出口室１５との間に空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７とを設ける。入口室１４に冷媒回収通路２１を連通させ、抽気室２で抽気した抽気ガスを冷媒分離器１７に流し、気体分離膜１６により分子の大きさの異なる空気と冷媒とを分離し、気体分離膜１６を透過しない冷媒を冷媒回収通路２１を介して回収し、空気とともに外部に排出される冷媒ガス量を減少させる。



1

【特許請求の範囲】

【請求項1】　不凝縮ガスの抽気室２をもつ抽気ドラム１と、入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７とを備え、前記入口室１４を前記抽気室２に連通させると共に、前記出口室１５に大気開放の排出路２０を連通させ、前記入口室１４に冷媒回収通路２１を連通させていることを特徴とする冷凍機用抽気装置。

【請求項2】　不凝縮ガスの抽気室２をもつ抽気ドラム１と、入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する中空糸膜３０を介装した冷媒分離器１７ａとを備え、前記入口室１４を前記抽気室２に連通させると共に、出口室１５に冷媒回収通路２１を連通させる一方、前記中空糸膜３０の外側を大気に開放していることを特徴とする冷凍機用抽気装置。

【請求項3】　冷凍機における凝縮器３のガス域に連通する抽気配管４０と、該抽気配管４０に接続され前記凝縮器３のガス域における被抽気ガスを吸引して吐出する抽気ポンプ４１と、前記被抽気ガスを凝縮させる抽気用凝縮器４３と、この凝縮器４３の出口に接続され不凝縮ガスと凝縮した冷媒とを分離する抽気室２ａをもった抽気ドラム１ａと、前記抽気室２ａに連通する入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７ｂを設けていることを特徴とする冷凍機用抽気装置。

【請求項4】　冷凍機における凝縮器３のガス域と連通する抽気室２をもった抽気ドラム１を備え、前記冷凍機における凝縮圧力と前記ドラム１の内圧との差圧で抽気するようにした抽気装置において、前記抽気室２に連通する入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７を設けると共に、前記入口室１４と前記抽気室２との間に連通路１３を設けて、該連通路１３に抽気室２の不凝縮ガスを加圧して前記入口室１４に供給する加圧ポンプ４１ａを介装していることを特徴とする冷凍機用抽気装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、冷凍機用抽気装置、詳しくは、ターボ冷凍機などの凝縮器内に溜る空気を含む不凝縮ガスを抽出して外部に排出する冷凍機用抽気装置に関する。

【０００２】

【従来の技術】従来、この種冷凍機用抽気装置は、例えば、特開平２－２５４２７１号公報に開示され、かつ、

2

内装し、この冷却器Ｄに蒸発器Ｇの液域から液冷媒を流通させて、前記接続管Ｂから前記抽気ドラムＣに開放される冷媒ガスと空気との混合ガスを冷却し、この冷却により冷媒ガスを凝縮させて空気を含む不凝縮ガスから分離すると共に、凝縮しないで前記抽気ドラムＣに残る空気を含む不凝縮ガスを前記抽気ドラムＣの上部に接続した排出路Ｆから抽気弁Ｅを開いて外部に排出するようにしている。

【０００３】

【発明が解決しようとする課題】所が、以上のような冷凍機用抽気装置では、前記抽気ドラムＣで前記冷却器Ｄの冷却により冷媒ガスを凝縮させて空気を含む不凝縮ガスと分離するのであるから、完全に分離されることなく一部の冷媒ガスは前記抽気弁Ｅの開動作により空気とともに外部に排出される問題があった。

【０００４】本発明は、前記抽気ドラムＣにおいて冷媒と分離する不凝縮ガスは主として空気であって、この空気を構成する酸素及び窒素の分子の大きさは、冷凍機に冷媒として用いるフロンＲ１２３を一例として比較しても、その分子の大きさより小さい。即ち、酸素分子の大きさは２．９Å、窒素分子の大きさは３．１～３．３Åであるのに対し冷媒として用いる例えばフロンＲ１２３の分子の大きさは９．４Åであることに着目し、これら分子の大きさの差を利用して前記抽気ドラムＣから排出する不凝縮ガスから冷媒ガスを有効に分離できるようにしたもので、その目的は、抽気ドラムから空気とともに外部に排出される冷媒ガス量を減少させる点にある。

【０００５】

【課題を解決するための手段】上記目的を達成するため、本発明では、不凝縮ガスの抽気室２をもつ抽気ドラム１と、入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７とを備え、前記入口室１４を前記抽気室２に連通させると共に、前記出口室１５に大気開放の排出路２０を連通させ、前記入口室１４に冷媒回収通路２１を連通させたのである。

【０００６】また、不凝縮ガスの抽気室２をもつ抽気ドラム１と、入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する中空糸膜３０を介装した冷媒分離器１７ａとを備え、前記入口室１４を前記抽気室２に連通させると共に、出口室１５に冷媒回収通路２１を連通させる一方、前記中空糸膜３０の外側を大気に開放してもよい。

【０００７】また、冷凍機における凝縮器３のガス域に連通する抽気配管４０と、該抽気配管４０に接続され前記凝縮器３のガス域における被抽気ガスを吸引して吐出する抽気ポンプ４１と、前記被抽気ガスを凝縮させる抽気用凝縮器４３と、この凝縮器４３の出口に接続され不

１４及び出口室１５をもち、前記入口室１４と出口室１５との間に空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７ｂを設けてもよい。

【０００８】更に、冷凍機における凝縮器３のガス域と連通する抽気室２をもった抽気ドラム１を備え、前記冷凍機における凝縮圧力と前記ドラム１の内圧との差圧で抽気するようにした抽気装置において、前記抽気室２に連通する入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７を設けると共に、前記入口室１４と前記抽気室２との間に連通路１３を設けて、該連通路１３に抽気室２の不凝縮ガスを加圧して前記入口室１４に供給する加圧ポンプ４１ａを介装してもよい。

【０００９】

【作用】前記抽気室２において抽気された不凝縮ガスは、凝縮しないで残った冷媒ガスとともに前記入口室１４に流入し、分子の大きさが冷媒ガスに比較して小さい主として空気から成る不凝縮ガスは、前記気体分離膜１６を透過して前記出口室１５へ流入し、前記排出路２０から外部に排出されるのに対し、冷媒ガスは前記気体分離膜１６を透過することなく前記入口室１４から前記冷媒回収通路２１を介して有効に回収することができる。

【００１０】従って、前記抽気室２において抽気された不凝縮ガスを前記冷媒分離器１７の前記出口室１５から外部に排出する場合、空気とともに外部に排出される冷媒ガス量を減少させることができる。

【００１１】また、入口室１４及び出口室１５との間に中空糸膜３０を介装した冷却分離器１７ａを備え、出口室１４に冷媒回収通路２１を接続すると共に、前記中空糸膜３０の外側を大気に開放する構成とするときは、抽気室２において抽気された不凝縮ガスが、冷媒ガスとともに前記入口室１４に流入するが、前記中空糸膜３０を通過中に分子の大きさが冷媒ガスに比較して小さい主として空気から成る不凝縮ガスが前記中空糸膜３０の内側から外側に透過して大気に排出される一方、前記中空糸膜３０を透過しない殆どの冷媒ガスは前記出口室１５に流入することになって、前記冷媒回収通路２１を介して回収されるのである。

【００１２】従って、前記抽気室２において抽気された不凝縮ガスを、前記冷媒分離器１７ａの前記中空糸膜３０から大気に開放でき、空気とともに外部に排出される冷媒ガス量を減少させることができながら、前記中空糸膜３０は耐圧強度が大きいので、空気をして前記中空糸膜３０を透過させる圧力を充分高くできるから、それだけ空気と冷媒ガスとの分離効果を増大させることができる。

【００１３】また、前記抽気ポンプ４１により前記凝縮器３のガス域における被抽気ガスを吸引し、前記抽気用凝縮器４３で凝縮してから前記抽気室２ａに流入させて、主として空気から成る不凝縮ガスと凝縮した冷媒とを分離し、更に、この不凝縮ガスを前記冷媒分離器１７ｂで空気と冷媒ガスとに分離するときは、前記入口室１４における圧力、即ち、前記気体分離膜１６の一次側における不凝縮ガスの圧力を高くして、前記気体分離膜１６による空気と冷媒ガスの分離効率を向上させることができ、空気とともに外部に排出される冷媒ガス量を一層減少させることができるのである。

【００１４】更に、冷凍機における凝縮圧力と抽気ドラム１の内圧との差圧で抽気する抽気装置において、加圧ポンプ４１ａにより前記冷媒分離器１７の入口室１４における主として空気から成る不凝縮ガスを加圧するようにした場合は、前記気体分離膜１６の一次側の圧力を高くでき、前記抽気室２における抽気ガスの圧力が比較的低いオートパージ形の抽気装置であっても、前記気体分離膜１６による空気と冷媒ガスとを分離する分離効果を向上させることができ、空気とともに外部に排出する冷媒ガス量を確実に減少させることができる。

【００１５】

【実施例】図１に示したものは、抽気ドラム１の抽気室２内で冷凍機における凝縮器３からの被抽気ガスを冷却することにより抽気する冷凍機用抽気装置を示しており、冷凍機における凝縮器３のガス域に接続管４を介して接続する前記抽気ドラム１の抽気室２に、コイル状とし、かつ、入口側を前記凝縮器３の液域に接続した冷却器５を内装し、この冷却器５に前記凝縮器３の液域から液冷媒を流通させて、前記接続管４から前記抽気ドラム１に開放される冷媒ガスと空気との混合ガスである被抽気ガスを冷却し、この冷却により冷媒ガスを凝縮させて冷媒液と水とを空気を含む不凝縮ガスから分離し、凝縮した冷媒液を、前記抽気室２の下部中央に設けたフロート室６から冷媒戻し配管７を介して冷凍機の蒸発器８へ戻して回収すると共に、水を排水弁９を介して前記抽気室２の下部外周部に設けたセパレータ１０から排水するようにしている。

【００１６】また、前記抽気室２の上部側と前記凝縮器３のガス域との間には、この凝縮器３のガス域の圧力と前記抽気室２の内圧との差圧を検出する抽気差圧スイッチ１１を設けると共に、前記抽気室２の上部には前記差圧スイッチ１１の作動により開閉する電磁弁１２を介装した連通路１３を接続し、この電磁弁１２の開動作により冷媒を含んだ不凝縮ガス、即ち抽気ガスを前記抽気室２から流出できるようにしている。

【００１７】更に、前記抽気ドラム１の上部側には、入口室１４及び出口室１５をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７を設けるのであって、前記気体分離膜１６を、例えば、宇部興産株式会社製のポリイミド非対称膜を用い、シート状で、かつ、空気を構成する酸素や窒素を透過させるが、分子の大きさが大きい

5

冷媒ガスを透過させない膜状に形成すると共に、図２に示したように補強部材１８で補強して、この補強部材１８とともに前記気体分離膜１６を支持部材１９を介して前記冷媒分離器１７の高さ方向中間部に取付け、前記気体分離膜１６を介して前記入口室１４及び出口室１５を区画し、空気を構成する酸素や窒素が前記入口室１４から前記出口室１５へ前記気体分離膜１６を透過することにより空気と前記気体分離膜１６を透過しない冷媒ガスとを分離できるようにする。

【００１８】また、前記抽気室２に接続した前記連通路１３の先端部を前記入口室１４に接続し、この連通路１３を介して前記入口室１４を前記抽気室２に連通させて、前記抽気室２において抽気され冷媒ガスの含有量が少なくなった不凝縮ガスから成る抽気ガスを前記入口室１４へ供給できるようにする。

【００１９】また、前記出口室１５に大気開放の排出路２０を連通させて、前記気体分離膜１６を透過した酸素や窒素から成る空気を前記出口室１５から外部に排出できるようにすると共に、前記入口室１４に前記冷媒戻し配管７に連通した冷媒回収通路２１を連通させ、前記気体分離膜１６を透過しない冷媒を前記冷媒回収通路２１を介して前記蒸発器８へ戻し、回収できるようにするのである。

【００２０】尚、２２及び２３は、前記排出路２０及び前記冷媒回収通路２１にそれぞれ介装した開閉弁である。

【００２１】しかして、前記冷却器５の冷却により前記抽気室２において冷媒ガスは凝縮して不凝縮ガスと分離されるが、凝縮しないで残った冷媒ガスは不凝縮ガスとともに前記電磁弁１２の開動作により前記入口室１４に流入する。そして、冷媒ガスに比較して分子の大きさが小さい酸素と窒素とから成る空気が前記気体分離膜１６を透過して前記出口室１５へ流入し、前記排出路２０から外部に排出される一方、冷媒ガスは前記気体分離膜１６を透過することなく空気と分離され、前記入口室１４から前記冷媒回収通路２１を介して前記蒸発器８に回収されるのである。

【００２２】従って、前記抽気室２において抽気された不凝縮ガスを前記冷媒分離器１７の前記出口室１５から前記排出路２０を介して外部に排出する場合、空気とともに外部に排出される冷媒ガス量を減少させることができるのである。

【００２３】図１に示した第１実施例では、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７を用いたが、図３に示した第２実施例のように、空気と冷媒とを分離する中空糸膜３０を介装した冷媒分離器１７ａを用いてもよい。

【００２４】即ち、この冷媒分離器１７ａは、前記入口室１４と前記出口室１５とを隔離して設けると共に、前

6

記入口室１４と前記出口室１５との間に、例えば宇部興産株式会社製のポリイミド非対称膜を直径１㎜程度の円筒状で、かつ、糸状に形成した中空糸膜３０を多数気密状に保持して形成するのであって、これら中空糸膜３０を介して前記入口室１４及び出口室１５を互いに連通させる。また、前記出口室１５に前記冷媒戻し配管７に連通した前記冷媒回収通路２１を連通させると共に、前記中空糸膜３０の外側を大気に開放するのである。

【００２５】以上のように構成した第２実施例では、前記抽気室２において冷却により抽気された不凝縮ガスは、凝縮しないで残った冷媒ガスとともに前記連通路１３から前記入口室１４に流入し、前記中空糸膜３０を通過中に分子の大きさが冷媒ガスに比較して小さい主として空気から成る不凝縮ガスが前記中空糸膜３０の内側から外側に透過して大気に排出される一方、前記中空糸膜３０を内側から外側へ透過しない殆どの冷媒ガスは前記冷媒分離器１７ａの前記出口室１５に流入することになって、前記冷媒回収通路２１を介して前記蒸発器８に回収されるのである。

【００２６】従って、前記抽気室２において抽気された不凝縮ガスを前記冷媒分離器１７ａの前記中空糸膜３０から大気に開放でき、空気とともに外部に排出される冷媒ガス量を減少させることができるのである。

【００２７】また、前記中空糸膜３０はシート状に形成した前記気体分離膜１６に比較して耐圧強度が大きいので、空気をして前記中空糸膜３０を透過させる圧力を充分高くできるから、それだけ空気と冷媒ガスとの分離効果を増大させることができるのである。

【００２８】図１及び図３に示した実施例では、前記抽気室２に前記冷却器５を設けて、該抽気室２内で被抽気ガスを冷却し、この冷却により冷媒ガスを凝縮させて不凝縮ガスを抽気するようにしたオートパージタイプの抽気装置に適用したものであるが、図４に示す第３実施例のように、抽気ポンプ及び抽気用凝縮器を用いたレシプロタイプの抽気装置にも適用できる。

【００２９】図４に示した第３実施例は、冷凍機における凝縮器３のガス域に連通する抽気配管４０を設けて、この抽気配管４０に抽気ポンプ４１を接続し、該抽気ポンプ４１の運転により、前記抽気配管４０を介して前記凝縮器３のガス域における被抽気ガスを吸引できるようにすると共に、前記抽気ポンプ４１の吐出側にファン４２を付設した抽気用凝縮器４３と、不凝縮ガスと凝縮した液冷媒とを分離する抽気室２ａをもった抽気ドラム１ａとを設けて、前記抽気ポンプ４１から吐出する被抽気ガスを前記抽気用凝縮器４３で凝縮すると共に、前記抽気ドラム１ａの抽気室２ａにおいて不凝縮ガスと凝縮した冷媒液とを分離し、冷媒液を前記抽気ドラム１ａの下部に接続した冷媒戻し管４４を介して冷凍機の蒸発器８に戻すようにしたもので、前記抽気室２ａには、運転停止時閉となる電磁弁４５及び圧力計４６を途中に介装し

た連通路４７を接続しており、この連通路４７を介して前記抽気室２ａを後記する冷媒分離器１７ｂの入口室１５に連通させている。

【００３０】前記冷媒分離器１７ｂは円筒状のケーシング４８を用い、該ケーシング４８の長さ方向一端部には前記連通路４７を介して前記抽気室２ａに連通する入口室１５を、また、他端部には冷凍機における蒸発器８に連通する冷媒回収通路２１を接続した出口室１５を形成すると共に、前記入口室１４と出口室１５との間で、かつ、前記ケーシング４８の内側に、図３に示した実施例と同様の中空糸膜３０を多数配設して構成するのである。この中空糸膜３０は、図５に拡大して示したように、図３の実施例と同様気体分離膜１６を直径１㎜程度の円筒状に形成するのであって、これら中空糸膜３０の貫通孔４９を介して前記入口室１４及び出口室１５を互いに連通させる一方、前記ケーシング４８の両端部には、該ケーシング４８の内部に開口し、前記貫通孔４９から前記中空糸膜３０の外側へ透過した不凝縮ガスである空気を前記ケーシング４８から外気に排出する排出管５０をそれぞれ設けるのである。

【００３１】尚、５１は、前記冷媒回収通路２１に設けた絞りであって、この絞り２１により前記中空糸膜３０の前記貫通孔４９内に圧力が作用するようにしている。また、この絞り５１に代えて圧力調整弁を用いてもよい。また、図４において、前記冷媒回収通路２１は蒸発器８に接続したが前記凝縮器３の液域に接続してもよい。

【００３２】以上のように構成した図４の第３実施例の場合には、前記抽気ポンプ４１の運転により、前記凝縮器３のガス域における空気を含む不凝縮ガスと冷媒ガスとの混合ガスである被抽気ガスを吸引して、該被抽気ガスを前記抽気用凝縮器４３に導き、冷媒ガスを凝縮してから、前記抽気室２ａへ流入させて該抽気室２ａにおいて主として空気から成る不凝縮ガスと凝縮した冷媒液とを分離する。そして、分離した冷媒液は前記抽気ドラム１ａの下部に接続した冷媒戻し管４４を介して冷凍機の蒸発器８に戻されるのである。

【００３３】一方、凝縮した冷媒液や水と分離した不凝縮ガスのうち空気は、凝縮しないで残った冷媒ガスとともに前記連通路４７を介して前記冷媒分離器１７ｂの入口室１４へ流入し、更に、前記中空糸膜３０を形成する前記気体分離膜１６を前記貫通孔４９から外側に透過して冷媒ガスから分離され、前記ケーシング４８から前記排出管５０を介して大気に排出される一方、前記気体分離膜１６を透過しない冷媒ガスは前記出口室１５に流入することになって、前記冷媒回収通路２１を介して前記蒸発器８に回収されるのである。

【００３４】従って、前記排出管５０から空気とともに外部に排出される冷媒ガス量を減少させることができるのである。

【００３５】所で、図４の実施例を用い、冷媒としてフロンＲ１２３を用いた場合空気とともに外気に排出される冷媒ガスの排出量を調べてみたところ、図６に示したテスト結果が得られた。図６において、横軸には前記圧力計４６で計測する前記入口室１４における圧力、つまり前記中空糸膜３０への供給圧力を示すと共に、縦軸には前記排出管５０から排出される排出空気量及び排出される空気量に含まれるフロンＲ１２３の容積％つまり濃度を示している。尚、曲線Ａは排出空気量の変化を、また、曲線ＢはフロンＲ１２３の変化を示している。

【００３６】このテスト結果から判るように、前記冷媒分離器１７ｂの前記排出管５０から排出される排出空気量に占めるフロンＲ１２３の容積％は、曲線Ｂのように変化するのであって、例えば、前記入口室１４の圧力が２Kg／㎠ Gのとき、排出空気量０．２６l／時で、この排出空気量に占める冷媒Ｒ１２３の容積％は３％に減少できるのである。

【００３７】従って、図６に示したように前記排出空気量に占める冷媒Ｒ１２３の容積％を減少させることができるのであって、前記冷媒分離器１７ｂを用いないときに比較して空気とともに外部に排出する冷媒ガス量を減少させることができる。

【００３８】以上のように図４に示した第３実施例では、抽気ポンプ４１を用い、前記冷媒分離器１７ｂに抽気ガスを加圧して供給するようにしたが、図１に示したように、差圧で前記冷媒分離器１７の入口室１４へ抽気ガスを供給する場合、図７に示したように、連通路１３に加圧ポンプ４１ａを介装して、該加圧ポンプ４１ａにより前記抽気室２の不凝縮ガスを加圧してから前記入口室１４に供給してもよい。

【００３９】図７に示した実施例では、前記加圧ポンプ４１ａを設けて前記抽気室２から流出する抽気された抽気ガスを加圧できるようにしているから、前記入口室１４の圧力、即ち、前記気体分離膜１６の一次側の圧力を高くすることができ、図６に示したように前記入口室１４の圧力を一定以上、例えば２Kg／㎠ Ｇ以上にすることができるから、前記抽気室２における抽気ガスの圧力が比較的低いオートパージ形の抽気装置であっても、前記冷媒分離器１７の前記出口室１５から前記排出路２０を介して空気とともに外部に排出される冷媒ガス量を減少させることができるのである。

【００４０】尚、この場合、前記入口室１４へ流入する前記抽気ガスの圧力が２Kg／㎠ Ｇ以上であっても長時間空気を分離できるように前記気体分離膜１６を前記補強部材１８により充分補強するのは言うまでもない。

【００４１】また、図７に示した実施例において、図４に示した冷媒分離器１７ｂを用いてもよい。

【００４２】

【発明の効果】以上説明したように、不凝縮ガスの抽気室２をもつ抽気ドラム１と、入口室１４及び出口室１５

9

をもち、前記入口室１４と出口室１５との間に、空気と冷媒とを分離する気体分離膜１６を介装した冷媒分離器１７とを備え、前記入口室１４を前記抽気室２に連通させると共に、前記出口室１４に大気開放の排出路２０を連通させ、前記入口室１４に冷媒回収通路２１を連通させているから、前記抽気室２から前記入口室１４に導入された冷媒ガスを含む不凝縮ガスのうち、分子の大きさが冷媒ガスに比較して小さい主として空気から成る不凝縮ガスは前記気体分離膜１６を透過して前記出口室１５へ流入し、前記排出路２０から外部に排出されるのに対し、冷媒ガスは前記気体分離膜１６を透過することなく前記入口室１４から前記冷媒回収通路２１を介して有効に回収することができる。

【００４３】従って、前記抽気室２において抽気された不凝縮ガスを、前記冷媒分離器１７の前記出口室１４から外部に排出する場合、空気とともに外部に排出される冷媒ガス量を減少させることができるのである。

【００４４】また、入口室１４及び出口室１５との間に中空糸膜３０を介装した冷却分離器１７ａを備え、出口室１４に冷媒回収通路２１を接続すると共に、前記中空糸膜３０の外側を大気に開放するように構成したときは、凝縮しないで残った冷媒ガスとともに前記入口室１４に流入する不凝縮ガスのうち、分子の大きさが冷媒ガスに比較して小さい主として空気から成る不凝縮ガスは、前記中空糸膜３０の内側から外側に透過して大気に排出されるし、前記中空糸膜３０を透過しない殆どの冷媒ガスは前記出口室１５に流入して、前記冷媒回収通路２１を介して回収されるのである。

【００４５】従って、空気とともに外部に排出される冷媒ガス量を減少させることができながら、前記中空糸膜３０は耐圧強度が大きいので、空気をして前記中空糸膜３０を透過させる圧力を充分高くできるから、それだけ空気と冷媒ガスとの分離効果を増大させることができる。

【００４６】また、前記抽気ポンプ４１により前記凝縮器３のガス域における被抽気ガスを吸引し、前記抽気用凝縮器４３で凝縮してから前記抽気室２ａに流入させて、主として空気から成る不凝縮ガスと凝縮した冷媒とを分離し、更に、この不凝縮ガスを前記冷媒分離器１７ｂで空気と冷媒ガスとに分離するときは、前記入口室１

10

４における圧力、即ち、前記気体分離膜１６の一次側における不凝縮ガスの圧力を高くして、前記気体分離膜１６による空気と冷媒ガスの分離効率を向上させることができ、空気とともに外部に排出される冷媒ガス量を一層減少させることができるのである。

【００４７】更に、冷凍機における凝縮圧力と抽気ドラム２の内圧との差圧で抽気する抽気装置において、加圧ポンプ４１ａにより前記冷媒分離器１７の入口室１４における主として空気から成る不凝縮ガスを加圧できるようにした場合は、前記気体分離膜１６の一次側の圧力を高くでき、前記抽気室２における抽気ガスの圧力が比較的低いオートパージ形の抽気装置であっても、前記気体分離膜１６による空気と冷媒ガスとを分離する分離効果を向上させることができ、空気とともに外部に排出する冷媒ガス量を確実に減少させることができる。

【図面の簡単な説明】

【図１】本発明の第１実施例を適用した冷凍機用抽気装置の配管系統図である。

【図２】図１に示したＡ部の拡大説明図である。

【図３】本発明の第２実施例を示す冷媒分離器の説明図である。

【図４】本発明の第３実施例を適用した冷凍機用抽気装置の配管系統図である。

【図５】第３実施例に用いた中空糸膜の拡大部分斜視図である。

【図６】第３実施例の冷凍機用抽気装置を用いたテスト結果を示すグラフである。

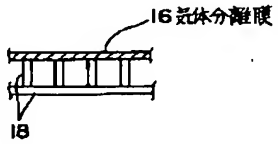
【図７】本発明の第４実施例を適用した冷凍機用抽気装置の配管系統図である。

【図８】従来を示す配管図である。

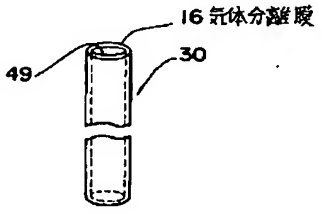
【符号の説明】

１　抽気ドラム
２　抽気室
１４　入口室
１５　出口室
１６　気体分離膜
１７　冷媒分離器
２０　排出路
２１　冷媒回収通路

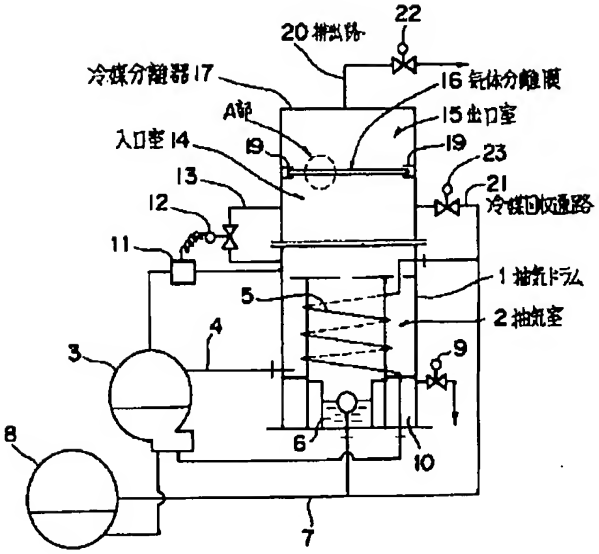
【図２】



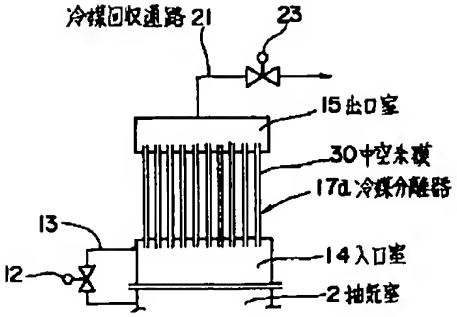
【図５】



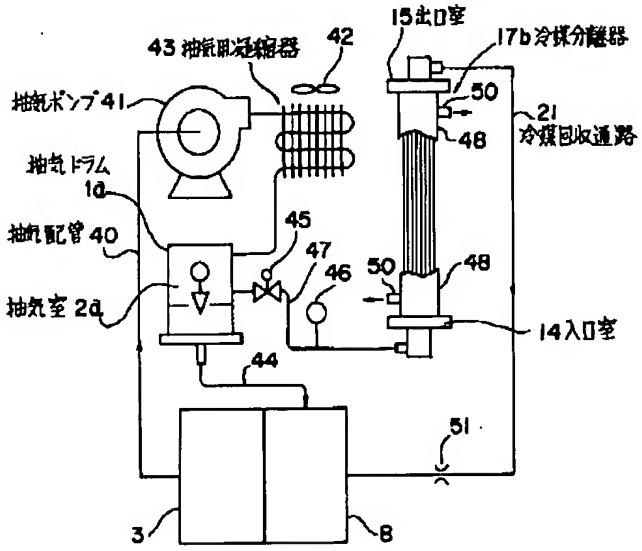
【図1】


20 排出弁
22
冷媒分離器 17
16 気体分離膜
A部
15 出口室
入口室 14
19
19
23
13
21
冷媒回収通路
12
11
1 抽気ドラム
5
2 抽気室
4
3
9
8
6
10
7

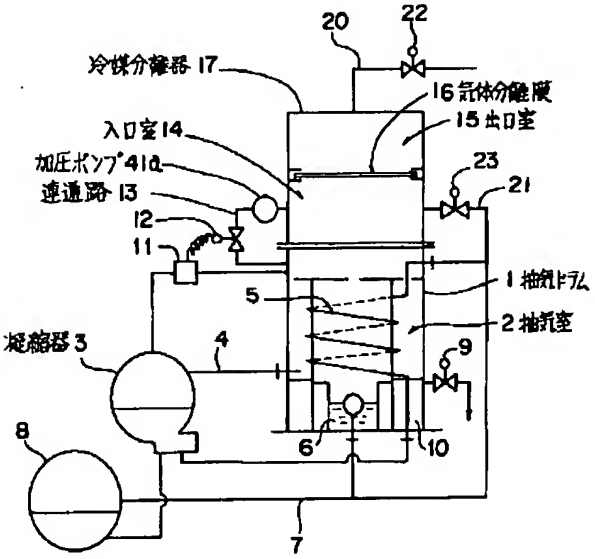
【図3】


冷媒回収通路 21
23
15 出口室
30 中空糸膜
17a 冷媒分離器
13
14 入口室
12
2 抽気室

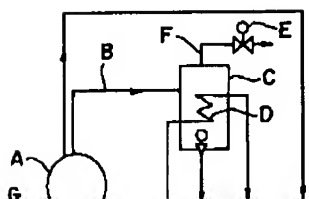
【図4】


15 出口室
43 抽気用凝縮器
42
17b 冷媒分離器
抽気ポンプ 41
50
21
冷媒回収通路
48
抽気ドラム
10
抽気配管 40
45
47
50
48
抽気室 2a
46
14 入口室
44
51
3
8

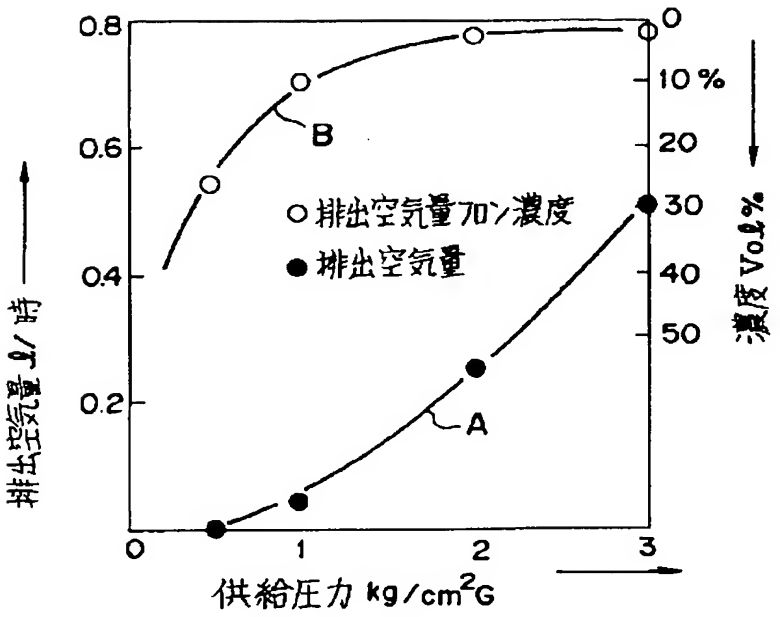
【図7】


20
22
冷媒分離器 17
16 気体分離膜
15 出口室
入口室 14
加圧ポンプ 41a
23
連通路 13
21
12
11
1 抽気ドラム
5
2 抽気室
凝縮器 3
4
9
8
6
10
7

【図8】


F
E
B
C
D
A
G

【図6】


0.8
0.6
0.4
0.2
0
1
2
3
0
10%
20
30
40
50
B
A
○排出空気量フロン濃度
●排出空気量
排出空気量 l/時
濃度 Vol%
供給圧力 kg/cm²G